

**The author of these student activities grants individual purchasers  
permission to make enough copies to satisfy the needs  
of their own students and classes.**

**This permission is intended to apply to individual teachers and  
not entire schools or school systems.**

**Copying of this document or its parts for resale is expressly prohibited.**

**COPYRIGHT 2013.**

*Thank you very much for your support and kind cooperation!*  
*- Audri K. Kowalyk B.Ed.*

# Reading: Basic Types of Firearms

In most criminal investigations involving the use of firearms, Forensic scientists typically examine three types of firearms: **hand guns**, **rifles** and **shotguns**. Each type of firearm is unique in terms of structure, function, and ballistic properties defined by velocity, kinetic energy and trajectory.

---

Important	<b>Distance:</b> <i>how far the bullet is projected from the muzzle of the firearm.</i>
terms	<b>Velocity:</b> <i>the speed at which the bullet leaves the barrel of the firearm.</i>
to	<b>Energy:</b> <i>: kinetic energy calculated by bullet mass multiplied by velocity.</i>
know...	<b>Trajectory:</b> <i>the path of a bullet, determined by velocity and kinetic energy.</i>

---

~~~~~

**HAND GUNS:** Handguns are classified as either **revolvers** or **pistols**.

~~~~~



## **1. REVOLVER**

**General Description:** Revolvers have been in existence since the mid-nineteenth century. The term “revolver” is derived from the fact that individual cartridges (bullets or rounds as they’re commonly known) are loaded into a cylinder that revolves with each pull of the trigger. With each turn of the cylinder a bullet is brought into line with the opening of the barrel. As the firing pin strikes the bullet’s primer (located at the base of the bullet), the gunpowder in the shell casing explodes, forcing the bullet out of the cylinder, into the opening of the barrel, down the length of the barrel, and out the muzzle. Muzzle “blast” can be quite substantial in revolvers, especially in the area where the cylinder lines up with the opening of the barrel. Revolvers typically hold six cartridges in a large variety of calibers, such as .22, .38, .357, and .44. Although still popular with gun collectors and shooting enthusiasts, the law enforcement community has largely discontinued use of the revolver because of low ammunition capacity and excessive reloading time.

**Velocity, Energy & Trajectory:** The ballistic properties of revolver ammunition varies by caliber. Typically, handgun ammunition of the caliber mentioned above display low muzzle velocities and limited amounts of kinetic energy, except in larger caliber such as .357 or .44 Magnum. The structure and design of revolvers, specifically because of the use of a cylinder, result in significant loss of kinetic energy and muzzle velocity due to the escape of gases around the cylinder and barrel opening when a bullet is fired from the gun.

**Commentary:** The enduring popularity of revolvers is due to the simplicity of their design. Individual parts fit together in such a way that these guns rarely jam. Since they are made with a small number of parts, they are relatively inexpensive to manufacture. Revolvers remain popular among collectors and people who like to engage in target shooting as a hobby. However, a surge in the use of automatic weapons among the criminal element in recently has caused law enforcement to adopt semi-automatic pistols for general usage due to their large magazine capacity.

## 2. PISTOL

**General Description:** Pistols are characterized by semi-automatic capabilities in which a slide sits atop the frame. Cartridges (bullets) are loaded into a magazine that is inserted into the handle of the pistol. Pistols operate differently from revolvers in that the barrel sits inside the slide. Each pull of the trigger causes a new bullet to be drawn into the opening of the barrel as the slide moves backwards with the force of the recoil. The slide then returns to its forward position, locking the bullet into the barrel. When the trigger is pulled again, the process repeats itself. Pistol bullet velocity can be considerably higher due to the fact that the hot gases emerging from the bullet casing are contained within the barrel of the pistol, thereby increasing the pressure acting against the bullet as it moves down the barrel and out the muzzle.

The unique design of semi-automatic pistols allows for higher magazine capacity (typically 10-16 bullets per magazine), faster reloading times, and volume of fire as the trigger can be pulled in rapid succession while still keeping the pistol on target. For example, a person using the .40 calibre Glock pistol pictured above would be able to accurately fire all 15 bullets in the same amount of time before loading a fresh magazine. Pistol ammunition varies in calibre, with 9mm, .40 and .45 being the most common. Law enforcement agencies across North America have switched to pistols using either 9mm or .40 calibre ammunition.



**Velocity, Energy & Trajectory:** The ballistic properties of pistol ammunition vary widely, just as they do for revolver ammunition. Generally speaking, 9mm and .40 caliber rounds will possess roughly the same kinetic energy and muzzle velocity as .38 or .357 rounds fired from a revolver. One major difference is that pistols can fire rounds in rapid succession and in larger volumes.

**Commentary:** Pistols vary widely in terms on model and caliber, and have become increasingly popular in recent decades. Since 1990, semi-automatic pistols such as the .40 Glock, 9mm Glock, and 9mm Smith & Wesson have largely replaced the .38 revolver in police agencies across North America. While occasionally prone to jamming if not properly maintained, pistols provide an effective defense against most threats faced on the street by police officers.

---

**RIFLES:** Rifles are designed in one of three ways: **bolt-action**, **lever action**, or **automatic**.

---

### 1. BOLT-ACTION RIFLE

**General Description:** Bolt-action rifles have existed since the late 1800's, serving as the principal type of weaponry for soldiers until World War II started in 1939. They are enormously popular with big-game hunters, farmers, and shooting enthusiasts. Bolt-action rifles are characterized by a bolt that sticks out the side, which allows the user to open the breech, extract a spent round, and chamber a new one into the barrel. Bolt-action rifles typically hold about 5 rifle cartridges, and are somewhat slow to reload. Telescopic sights can be used to help bring a target into focus. The use of a telescope, mounted along the barrel above the "action" of the rifle, increases the effective range of a bolt-action rifle to between 200 and 1000m, depending on its caliber.



**Velocity, Energy & Trajectory:** Because of the large shell casing for cartridges such as the .30-06 and 7mm caliber, bolt-action rifle bullets can possess extremely high muzzle velocities and kinetic energy levels. For example, while a standard .40 round commonly used by police agencies will have a muzzle velocity of 1000 ft/second and 400 ft-lbs of kinetic energy, a .308 round from a police sniper's bolt-action rifle will have a muzzle velocity of over 2600 ft/second and almost 2700 ft/lbs of

kinetic energy! In other words, a rifle bullet is larger, travels at a much faster speed, and has much more energy than a bullet fired by either a revolver or pistol.

Muzzle velocity, kinetic energy, and trajectory can vary widely, depending on the caliber of the rifle bullet, just as these measurements vary with revolver and pistol ammunition. However, the trajectory of rifle bullets can in some cases be much flatter than what would be exhibited by handgun ammunition. For example, a handgun round might fall into the dirt after it has traveled about 200m, or the length of two football fields. A rifle bullet, especially a large caliber bullet typically used in big game rifles, might travel over 3km before burrowing into the earth!

**Commentary:** Bolt-action rifles were the principal means of defense for the soldiers of most armies during WWII, however they have since been relegated to a sporting role, used largely by hunters and collectors. Bolt-action rifles are reliable and easy to maintain, varying widely in caliber and purpose.

## 2. LEVER ACTION RIFLE

**General Description:** Lever action rifles originated during the days of the Wild West. By the late 1800's gun manufacturers such as Winchester were producing these rifles in large numbers, which were popular with ranchers and settlers. The Winchester repeating rifle was used in large numbers by the US army as the prairie frontier was pushed westwards. Once a round has been fired from a lever action rifle, the user cocks the gun by pushing the lever forward and then snapping it shut again. A typical lever action rifle can hold 5-6 rounds in its magazine.



**Velocity, Energy & Trajectory:** Lever action rifles typically utilize ammunition of the .30-.30 caliber. This cartridge fires a heavy, relatively slow moving bullet that drops considerably over short distances. For example, a standard .30-.30 round will have a muzzle velocity of 2200 ft/second and 1800 ft/lbs of kinetic energy as the bullet leaves the muzzle of the gun. The low muzzle velocity and heavy bullet makes lever-action rifles a poor choice for long distance shooting, but suitable for hunting game in heavy brush.

**Commentary:** Lever action rifles remain in use today among ranchers and hunters because of their versatility and durability. They are not as popular as bolt-action rifles due to their ineffective muzzle velocity and inaccuracy over long distances.

## 3. AUTOMATIC RIFLE

**General Description:** Typically referred to as "assault rifles", automatic rifles are characterized by their ability to fire a continuous stream of bullets with each pull of the trigger. Illegal to own in Canada without completing a rigorous screening process, assault rifles are not common in Canada. The AR-15 pictured above is the standard issue weapon used within the US military and increasingly within police agencies across North America.



Automatic weapons are usually configured to operate in one of three different modes - single shot, semi-auto, or full auto. Assault rifles are accurate to approximately 200m, but are designed to direct a large number of bullets at a target in a brief period of time, necessary in a combat scenario. However, weapons such as the AR-15 can be modified for law enforcement use and are valued for their accuracy and stopping power.

**Velocity, Energy & Trajectory:** Automatic weapons, whether machine guns, assault rifles, or submachine guns fire a variety of ammunition, including .223, 9mm, and 7.62mm. Some of these rounds have flat trajectories, meaning the individual bullets travel great distances without falling into the dirt after being fired from a gun. For example, the .223 round, commonly used in the AR-15, might drop only 1-2cm over the length of two football fields, making it highly accurate.

**Commentary:** Because of the potential for high rates of fire and high muzzle velocities, automatic weapons are extremely dangerous if they fall into the wrong hands. This was demonstrated during the 1997 Los Angeles Bank of America robbery, in which two suspects armed with assault rifles engaged dozens of police officers as they attempted to escape.

~~~~~  
**SHOTGUNS:** The most common type of shotgun is the **.12 Gauge shotgun.**  
~~~~~

## **1. .12 GAUGE SHOTGUN**

**General Description:** Shotguns were designed to spray lead pellets over a large area, making them ideal for hunting birds or small animals that move quickly. Shotguns have existed since the mid 1800's, and have undergone very few modifications since WW II. The .12 gauge Remington 870 shotgun has been standard police issue for many years.



**Velocity, Energy & Trajectory:** Shotguns can fire a wide variety of shells, including birdshot, buckshot, and rifled slugs. Birdshot typically consists of large numbers of small lead pellets packed within the shell, which sits atop a shell casing. Buckshot consists of a smaller number of lead pellets that are larger in diameter. A standard buckshot round used by police agencies would contain approximately 9 lead pellets, each the size of a small pea. Its effective range is limited to within 20-30m. Rifled slugs are also used in shotguns, increasing the effective range to a football field in length. Slugs are lead bullets about the size of a man's thumb, and generate substantial amounts of kinetic energy over short distances. However, they rapidly lose height after approximately 100m, making shotgun slugs inaccurate beyond that distance.

**Commentary:** Shotguns are very popular due to their versatility and durability. Shotguns are widely owned in both Canada and the United States, and exist in a variety of forms. They are typically used for hunting and sports like skeet shooting. Shotguns have a magazine capacity of 3 to 4 rounds.

# Worksheet: Basic Types of Firearms

Name: \_\_\_\_\_ Date: \_\_\_\_\_

1. Enormously popular with big-game hunters, farmers, and shooting enthusiasts: \_\_\_\_\_
2. Name derived from the fact that individual cartridges are loaded into a cylinder that revolves with each pull of the trigger: \_\_\_\_\_
3. Designed to spray lead pellets over a large area, making them ideal for hunting birds or small animals that move quickly: \_\_\_\_\_
4. Characterized by their ability to fire a continuous stream of bullets with each pull of the trigger: \_\_\_\_\_
5. Characterized by semi-automatic capabilities in which a slide sits atop the frame: \_\_\_\_\_
6. Can fire a wide variety of shells, including birdshot, buckshot, and rifled slugs: \_\_\_\_\_
7. Used during the days of the Wild West; can typically hold 5 to 6 rounds in its magazine: \_\_\_\_\_
8. Typically hold six cartridges in a large variety of calibers: \_\_\_\_\_
9. Usually configured to operate in one of three different modes - single shot, semi-auto, or full auto: \_\_\_\_\_
10. Characterized by a bolt that sticks out the side, allows user to open the breech, extract a spent round, and chamber a new one into the barrel: \_\_\_\_\_
11. Has been largely phased out of use in the law enforcement community because of low ammunition capacity and reloading time: \_\_\_\_\_
12. Once a round has been fired from a lever action rifle, the user cocks the gun by pushing lever forward, then snapping it shut again: \_\_\_\_\_
13. Fire rounds in rapid succession, in larger volumes & have largely replaced the revolver in police agencies: \_\_\_\_\_
14. Accurate to approximately 200m, but are designed to direct a large number of bullets at a target in a brief time: \_\_\_\_\_
15. Typically hold about 5 rifle cartridges, somewhat slow to reload: \_\_\_\_\_
16. The barrel sits inside the slide, each pull of the trigger causes a new bullet to be drawn into the opening of the barrel as the slide moves backwards with the force of the recoil: \_\_\_\_\_

17. Typically utilize ammunition of the .30-.30 caliber; fires a heavy, relatively slow moving bullet which drops considerably over short distances: \_\_\_\_\_
18. Fire a variety of ammunition (e.g. .223, 9mm, and 7.62mm); rounds tend to have flat trajectories, meaning the individual bullets travel great distances without falling into the dirt: \_\_\_\_\_
19. Typically display low muzzle velocities and limited amounts of kinetic energy: \_\_\_\_\_
20. Allows for higher magazine capacity (typically 10-16 bullets per magazine), faster reloading times, and volume of fire as the trigger can be pulled in rapid succession while still keeping on target: \_\_\_\_\_
21. Low muzzle velocity and heavy bullet makes this a poor choice for long distance shooting, but suitable for hunting game in heavy brush: \_\_\_\_\_
22. Typically used for hunting and sports like skeet shooting. Shotguns have a magazine capacity of 3-4 rounds: \_\_\_\_\_
23. Large shell casing for cartridges (e.g. .30-06 and 7mm caliber); can possess extremely high muzzle velocities and kinetic energy levels: \_\_\_\_\_
24. Significant loss of kinetic energy and muzzle velocity due to the escape of gases around the cylinder and barrel opening when a bullet is fired from the gun: \_\_\_\_\_
25. Bullet velocity can be considerably higher because hot gases emerging from the bullet casing are contained within the barrel, thereby increasing the pressure acting against the bullet as it moves down the barrel and out the muzzle: \_\_\_\_\_
26. Individual parts fit together in such a way that these guns rarely jam; relatively inexpensive to manufacture: \_\_\_\_\_
27. Trajectory of bullets usually much flatter than handgun ammunition; bullets typically used by big game hunters can travel over 3km before hitting the ground: \_\_\_\_\_
28. Typically hold six cartridges in a large variety of calibers, such as .22, .38, .357, and .44: \_\_\_\_\_
29. Illegal to own in Canada without a rigorous screening process: \_\_\_\_\_
30. Telescopic sights can be used to help bring a target into focus: \_\_\_\_\_

## KEY - Worksheet: Basic Types of Firearms

- |     |  |                    |
|-----|--|--------------------|
| 1.  | Enormously popular with big-game hunters, farmers, and shooting enthusiasts:   | BOLT-ACTION RIFLE  |
| 2.  | Name derived from the fact that individual cartridges are loaded into a cylinder that revolves with each pull of the trigger:  | REVOLVER           |
| 3.  | Designed to spray lead pellets over a large area, making them ideal for hunting birds or small animals that move quickly:  | 12 GAUGE SHOTGUN   |
| 4.  | Characterized by their ability to fire a continuous stream of bullets with each pull of the trigger:   | AUTOMATIC RIFLE    |
| 5.  | Characterized by semi-automatic capabilities in which a slide sits atop the frame:   | PISTOL             |
| 6.  | Can fire a wide variety of shells, including birdshot, buckshot, and rifled slugs:   | 12 GAUGE SHOTGUN   |
| 7.  | Used during the days of the Wild West; can typically hold 5-6 rounds in its magazine:  | LEVER-ACTION RIFLE |
| 8.  | Typically hold six cartridges in a large variety of calibers:  | REVOLVER           |
| 9.  | Usually configured to operate in one of three different modes - single shot, semi-auto, or full auto:  | AUTOMATIC RIFLE    |
| 10. | Characterized by a bolt that sticks out the side, allows user to open the breech, extract a spent round, and chamber a new one into the barrel:                                      | BOLT-ACTION RIFLE  |
| 11. | Has been largely phased out of use in the law enforcement community because of low ammunition capacity and reloading time:   | REVOLVER           |
| 12. | Once a round has been fired from a lever action rifle, the user cocks the gun by pushing lever forward, then snapping it shut again:   | LEVER-ACTION RIFLE |
| 13. | Fire rounds in rapid succession, in larger volumes & have largely replaced the revolver in police agencies:  | PISTOL             |
| 14. | Accurate to approximately 200m, but are designed to direct a large number of bullets at a target in a brief time:  | AUTOMATIC RIFLE    |
| 15. | Typically hold about 5 rifle cartridges, somewhat slow to reload:  | BOLT-ACTION RIFLE  |
| 16. | The barrel sits inside the slide; each pull of the trigger causes a new bullet to be drawn into the opening of the barrel as the slide moves backwards with the force of the recoil: | PISTOL             |
| 17. | Typically utilize ammunition of the .30-.30 caliber; fires a heavy, relatively slow moving bullet which drops considerably over relatively short distance:                           | LEVER-ACTION RIFLE |



- |     |   |                    |
|-----|---|--------------------|
| 18. | Fire a variety of ammunition (eg .223, 9mm, and 7.62mm); rounds tend to have flat trajectories, meaning the individual bullets travel great distances without falling into the dirt:  | AUTOMATIC RIFLE    |
| 19. | Typically display low muzzle velocities and limited amounts of kinetic energy:  | REVOLVER           |
| 20. | Allows for higher magazine capacity (typically 10-16 bullets per magazine), faster reloading times, and volume of fire as the trigger can be pulled in rapid succession while still keeping on target:                                  | PISTOL             |
| 21. | Low muzzle velocity and heavy bullet makes this a poor choice for long distance shooting, but suitable for hunting game in heavy brush:   | LEVER-ACTION RIFLE |
| 22. | Typically used for hunting and sports like skeet shooting. Shotguns have a magazine capacity of 3-4 rounds:   | 12 GAUGE SHOTGUN   |
| 23. | Large shell casing for cartridges (e.g. .30-06 and 7mm caliber); can possess extremely high muzzle velocities and kinetic energy levels:  | BOLT-ACTION RIFLE  |
| 24. | Significant loss of kinetic energy and muzzle velocity due to the escape of gases around the cylinder and barrel opening when a bullet is fired from the gun:   | REVOLVER           |
| 25. | Bullet velocity can be considerably higher because hot gases emerging from the bullet casing are contained within the barrel, thereby increasing the pressure acting against the bullet as it moves down the barrel and out the muzzle: | PISTOL             |
| 26. | Individual parts fit together in such a way that these guns rarely jam; relatively inexpensive to manufacture:  | REVOLVER           |
| 27. | Trajectory of bullets usually much flatter than handgun ammunition; bullets fired from this gun can travel over 3km before hitting the ground:  | BOLT-ACTION RIFLE  |
| 28. | Typically hold six cartridges in a large variety of calibers, such as .22, .38. .357, and .44:  | REVOLVER           |
| 29. | Illegal to own in Canada without passing a rigorous screening process:  | AUTOMATIC RIFLE    |
| 30. | Telescopic sights on this forearm can be used to help bring a target into focus:  | BOLT-ACTION RIFLE  |